RESEARCH DEPARTMENT

THE U.H.F. TELEVISION SURVEY OF 1957/8: A COMPARISON OF THE FIELD STRENGTHS MEASURED BY THE B.B.C. MOBILE LABORATORY DURING THE SERIES A AND SERIES B TESTS

Report No. T-077

(1960/22)

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SUMMARY

This report describes the field strength measurements made by the B.B.C. mobile laboratory at the sites chosen for subjective assessments of picture quality. Comparison of the measurements made during the Series B tests with those made during the Series A tests shows that the two sets of measurements were statistically comparable as regards the field strengths measured at each site.

1. INTRODUCTION

The ultra high frequency (u.h.f.) television survey[1] carried out in 1957/58 had two objectives: to compare television reception in the u.h.f. Band V with reception in Band I, and to compare reception using the C.C.I.R. 625-line standard in Band V with reception using the 405-line standard in Band V. The tests were carried out in two series. During the first series (Series A), both Band I and Band V transmissions carried 405-line pictures which were identical and could be compared directly, but during the second (Series B), the Band V transmissions carried 625-line pictures. These were obtained from films and slides which were duplicates of the pictures transmitted on Band I using 405-line standards and could thus be compared as before.

During the Series A tests the B.B.C. mobile laboratory visited approximately four hundred sites and, although records were kept of the position of the vehicle at each site, it was not possible to guarantee that when each site was revisited several months later, during the Series B tests, the aerials were placed in exactly the original position in space. In order that a valid comparison could be made between the 405-line and 625-line transmissions in Band V it was important to check that the sites chosen for the two series were sufficiently nearly identical to avoid any significant difference in the reception conditions. It was also desirable to detect any systematic change in the transmitting equipment, the receiving aerials or the propagation conditions. Because the Band I transmissions were used as a standard for comparison in the two series, the same requirements applied in Band I. During each test the e.m.f.s obtained from the aerials in both bands were measured: in this report the e.m.f.s measured at each site in the two series are compared. Since the same aerials were used at a given site on both occasions, the ratio of the e.m.f. measured in Series A to that measured in the same band in Series B was equal to the ratio of the field strengths measured.

2. GEOGRAPHICAL DISTRIBUTION OF SITES

The B.B.C. mobile laboratory visited sites in four of the eight radials into which the survey area was divided. Details of these radials are given in Table 1.

TABLE 1

Radials surveyed by B.B.C. mobile laboratory

Radial No.	Direction from Crystal Palace	Principal Localities (in order of increasing distance from transmitter)
1	East	Sydenham, Sidcup, Dartford, Gravesend, Chatham, Maidstone, Faversham, Margate.
3	South	Norwood, Croydon, Coulsdon, Redhill, Crawley, East Grinstead, Haywards Heath.
7	North	Dulwich, Islington, Edmonton, Enfield, Hertford, Stevenage, Baldock.
8	North-East	Lewisham, Greenwich, Barking, Romford, Brentwood, Chelmsford, Colchester.

3. THE METHOD OF MEASUREMENT

The double-amplitude peak (d.a.p.) of the video-frequency output of the television receiver was measured with an oscilloscope. A signal generator was adjusted to have as nearly as possible the same frequency as the received signal, as judged by watching the beat pattern produced when the two signals were added. The receiver was then connected to the signal generator, of which the signal was 100% square-wave modulated. By adjusting the signal-generator output voltage until the d.a.p. of the waveform displayed on the oscilloscope corresponded with that for the received signal, the e.m.f. from the signal generator could be equated to that from the aerial and feeder. The field strength at the aerial could then be deduced, the relation between field strength and e.m.f. being known for each aerial.

The procedure at each site was to select the most satisfactory aerial position (within ± 2 ft (0·6 m) of 30 ft (9·1 m) height) and bearing, as judged by the quality of the received television picture. This might entail the aerial being directed so as to obtain a minimum reflection and might produce a different field strength from that obtained with the aerial pointed directly at the transmitter. Although this procedure is somewhat different from that normally used in field strength surveys, it is representative of the methods adopted during the installation of a domestic receiver and aerial.

4. DISCUSSION OF RESULTS

Fig. 1 shows in histogram form the percentage of sites at which the Series A, Channel 1 e.m.f. differed from the Series B e.m.f. by the abscissa value, while Fig. 2 shows a similar histogram for the Band V measurements. In both cases the median values of the distribution are within ±0·5 dB of zero, while the standard deviations from the medians are 3·5 dB and 5·5 dB, respectively.

Figs. 3 and 4 show the histograms for the results obtained in each of the four radials surveyed by the B.B.C. mobile laboratory, and the median values and standard deviations for the separate radials are shown in Table 2.

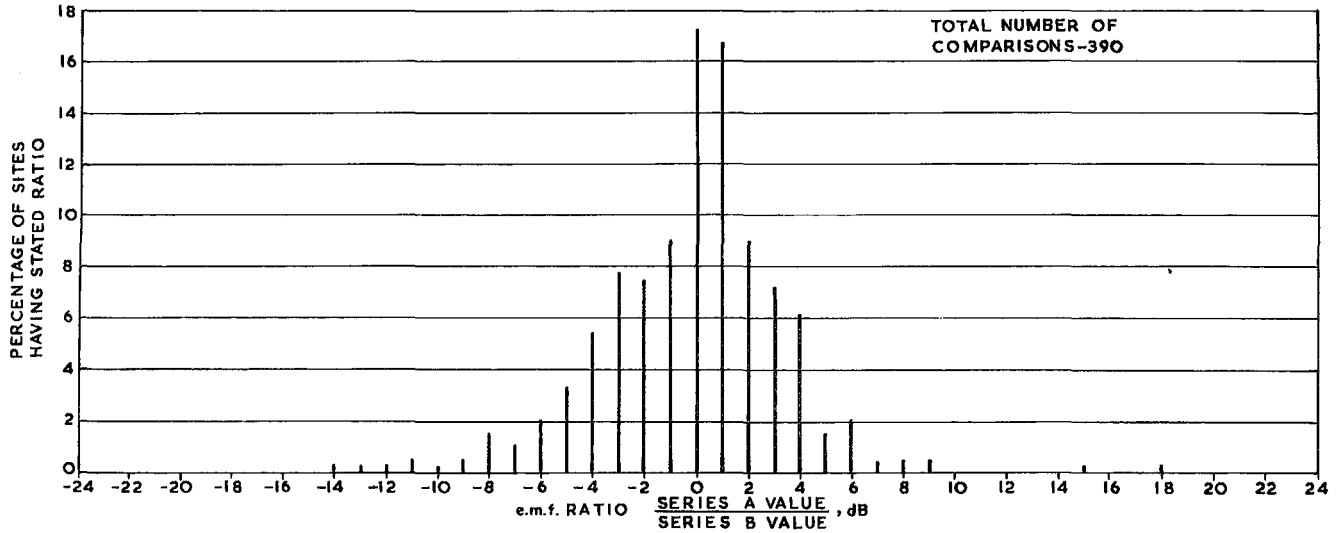

Fig. 1 - Histogram showing distribution of the ratio

$$\frac{\text{Channel 1 e.m.f. measured at a site during Series A tests}}{\text{Channel 1 e.m.f. measured at the same site during Series B tests}}$$

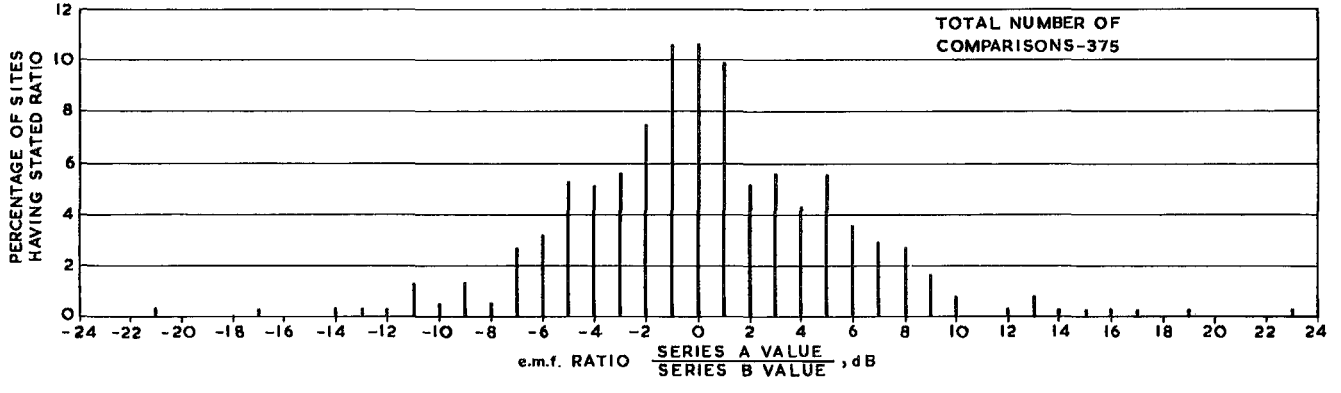

Fig. 2 - Histogram showing distribution of the ratio

$$\frac{\text{Band V e.m.f. measured at a site during Series A tests}}{\text{Band V e.m.f. measured at the same site during Series B tests}}$$

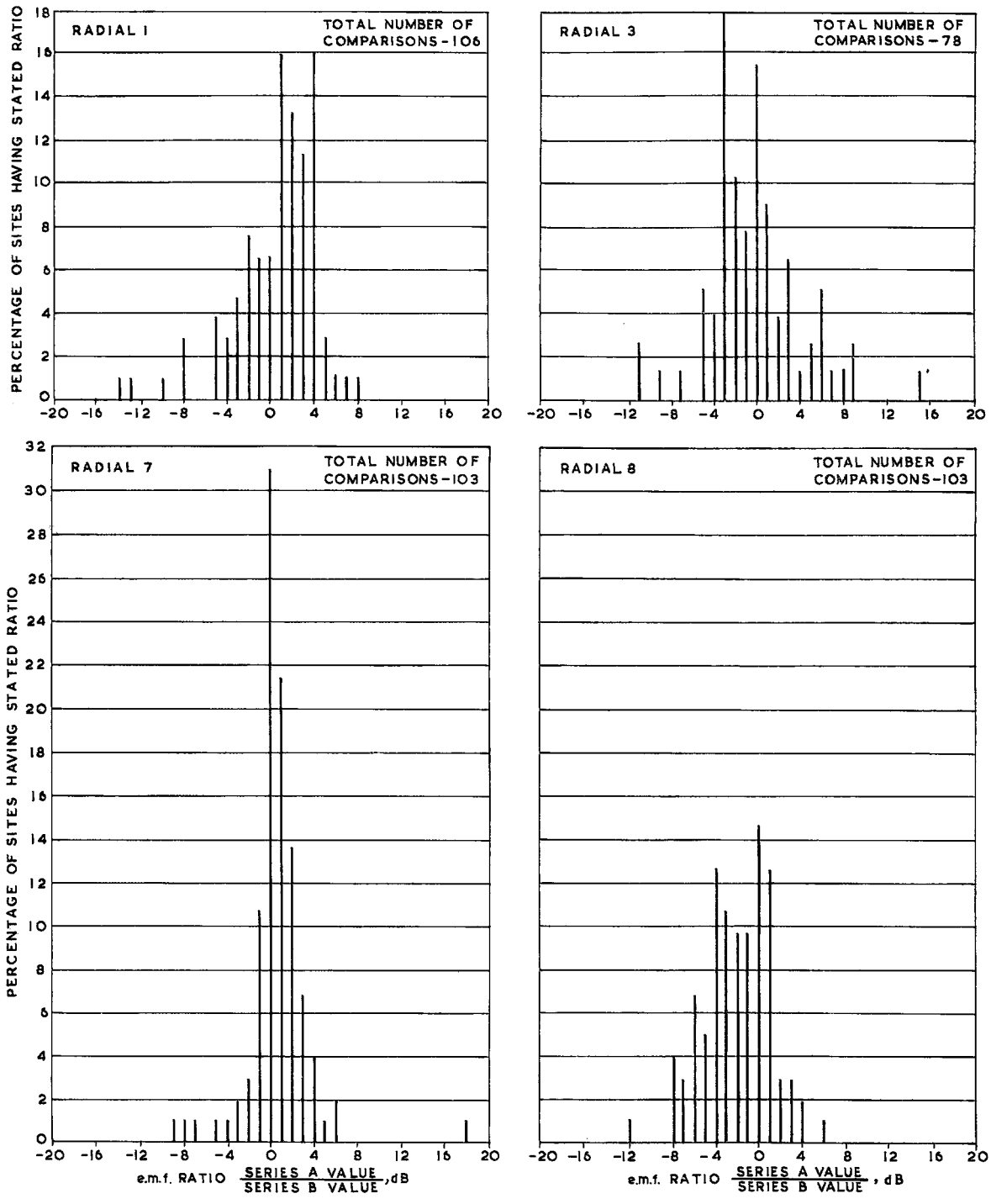

Fig. 3 - Histograms showing distribution of the ratio

Channel 1 e.m.f. measured at a site during Series A tests

Channel 1 e.m.f. measured at the same site during Series B tests

in each radi

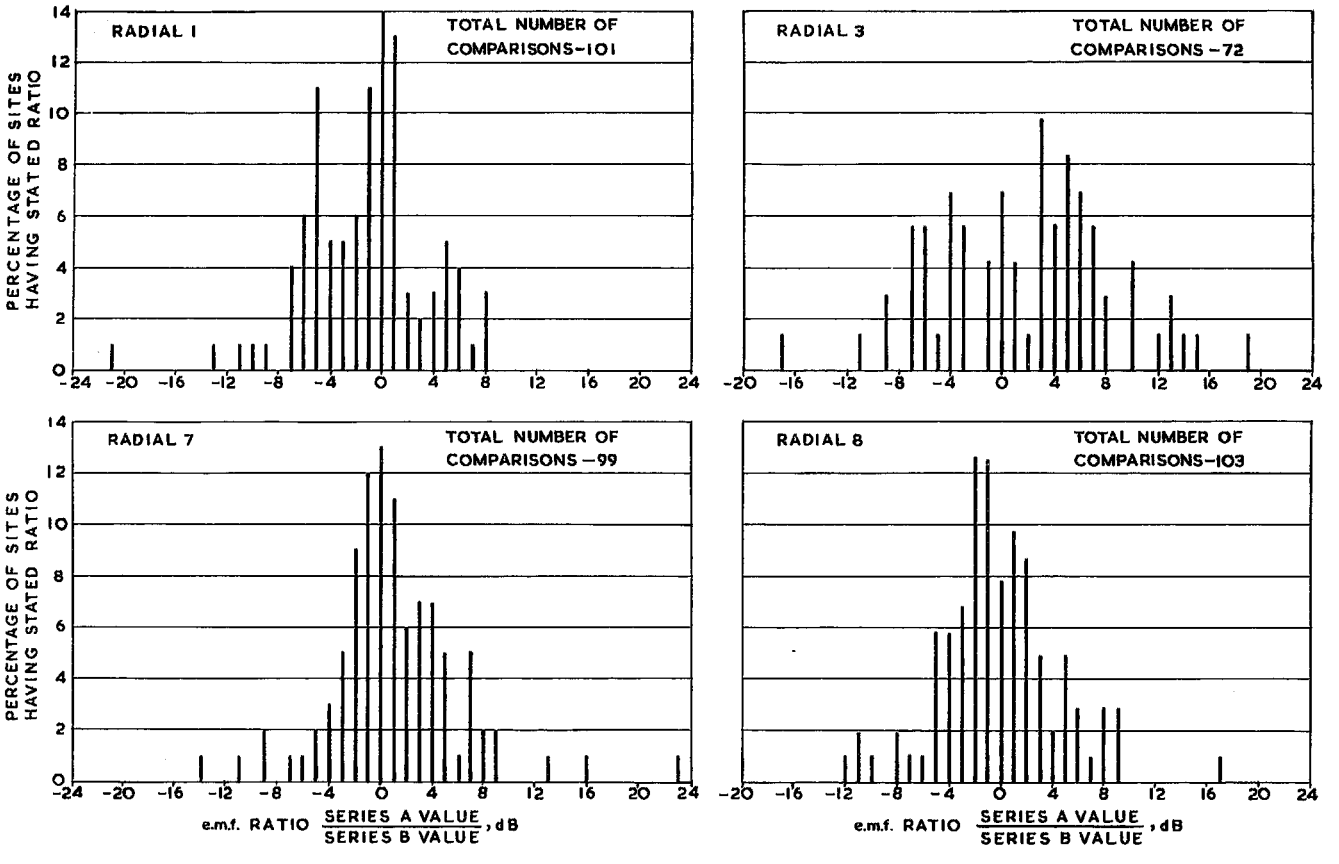

Fig. 4 - Histograms showing distribution of the ratio

$$\frac{\text{Band V e.m.f. measured at a site during Series A tests}}{\text{Band V e.m.f. measured at the same site during Series B tests}}$$ in each radial

TABLE 2

Comparison of e.m.f. (Series A value/Series B value) in each radial

Radial No.	Channel 1			Band V		
	Number of comparisons	Median value dB	Standard deviation dB	Number of comparisons	Median value dB	Standard deviation dB
1	106	+1·5	3·5	101	−0·5	5
3	78	−0·5	4	72	+3·0	7
7	103	+0·5	2·5	99	+0·5	5
8	103	−2	3	103	−0·5	4

It is of interest to note that radial 7 shows small departures of the median values from zero for both Channel 1 and Band V, together with reasonably small standard deviations, while the largest standard deviation (and in the case of Band V the largest median difference) occurs in radial 3. Radial 7 extends across the Thames Basin to the north of the transmitter over fairly flat terrain, in contrast with radial 3 which embraces undulating country to the south. Accordingly, sites selected in radial 3 were subject to a greater range of field strength distribution than that evident in radial 7, since the hills in the vicinity of the receiving site would produce more complex standing-wave patterns and multipath interference. It would appear from the results that the domestic installation of television aerials is likely, in general, to be less critical in radial 7 than in radial 3. The biggest errors occur in radial 1 and radial 8 for Channel 1 and in radial 3 for Band V. The Channel 1 errors will tend to nullify one another as far as field strength is concerned, while the Band V error will favour Series A, but these errors are not likely to produce subjective differences greater than a half of one grade.

5. CONCLUSIONS

The median signal-strength difference between Series A and Series B, including all the valid comparisons of measurements by the B.B.C. mobile laboratory, is small enough to be ignored. On the other hand, comparison of signal strengths measured in each of the four radials shows that, for Band V in radial 3, the Series A signal was greater than the Series B signal by 3 dB; this however, is not likely to produce a subjective difference greater than half a grade. The Channel 1 measurements show that radial 8 had a 2 dB increase of signal in Series B, and a 1·5 dB decrease in radial 1.

6. REFERENCE

1. "Television Field Trials of 405-line and 625-line Systems in the U.H.F. and V.H.F. Bands (1957/58)", published by the B.B.C., May 1960

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